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COMPLETE SPECIFICATION.

Improvements in or relating to Ball Point Pen, Inks, and to Methods of
Filling such Pens therewith.

We, FRANZ VERMES and MARIA VERMES, both German Nationals and both of 18 Palnkammerstrasse, Otterfing/Oberbayern, Germany, trading as VERMES-CHEMIE K.G.,

do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

10. The present invention is concerned with ball point pens and refills therefor containing an ink in paste form and is also concerned with a method of filling the reservoirs of said pens and of filling said pen refills.

15. Previously known ball point pen inks in paste form are glazing, i.e. they are not suitable for writing on dark surfaces, for example; on black album pages.

It is true that, in addition to soluble colouring media, it is also known to incorporate colour correction pigments in ball point pen inks in paste form. It has, however, previously not been possible to produce ball point pens, the pigment content of the inks of which was increased beyond 5% since, with too great a concentration, the pigments impair the writing properties of the ink, even when they are present in a very finely-divided form. This, therefore, has not been possible to produce ball point pens containing non-glazing covering inks in paste form by increasing the amount of pigment added to the inks.

In addition to ball point pens with paste inks containing soluble colouring media and pigments, so-called "liquid pencils" are also known in which graphite is suspended in solvents. Because of the greyish black colour of graphite, it is, however, not possible to write on dark surfaces with these liquid

pencils, since the necessary contrast for legibility is lacking.

It is also known to produce inks which are applied by a pen, brush or spray gun, by introducing a ground metal powder into a layer of adhesive.

The use of aluminium metal powders for painting, coating, colouring or similar purposes is also known.

Finally, it is known to introduce organic or inorganic pigments into paste inks for ball point pens.

None of the known proposals has satisfied the requirements necessary for the production of ball point pens which are suitable for writing on dark surfaces, particularly for writing on album pages.

An object of the present invention is to provide ball point pens and refills therefor which are suitable for this purpose.

According to one aspect of the present invention, there are provided ball point pens and refills therefor, containing an ink in paste form which comprises a polar or a non-polar dispersing medium having dispersed therein finely-divided aluminium, silver or copper or an alloy or mixture thereof, in an amount of from 5 to 95% of the total weight of the ink.

In a preferred embodiment, the finely-divided metals or metal alloys are present in the ink in an amount of from 20 to 80% of the total weight of the ink and are in the form of flakes. Metal particles in the form of flakes are particularly suitable because they can easily be passed through the annular gap between the writing ball and the surrounding parts of the writing point, even when they are of relatively great extent in the direction of the periphery of the said annular gap. As a rule, the size of the writing ball diameter of

about 1 mm. In this case, the size of the metal flakes can be between 1 and 20 microns, preferably between 5 and 15 microns.

It is surprising that metal particles, i.e. particles of relatively high specific gravity, remain dispersed in the dispersing media suitable for paste inks for ball point pens, even when stored or in use for long periods of time. It had, on the contrary, previously been assumed that, because of their high specific gravity, the metal particles would quickly precipitate.

The flake structure of the metal particles may contribute to the avoidance of the precipitation of the metal particles from the dispersing medium.

Whereas the usual procedure for filling ball point pen reservoirs is to introduce the paste ink from the rear into the reservoir, i.e. from the end remote from the writing point, whereupon any air inclusions are driven out by centrifuging, or else to introduce the ink from the front end and to set the writing point only on completion of the filling, whereupon centrifuging is also carried out in order to drive out air inclusions, when producing the ball point pens and refills therefor according to the present invention, it is advisable to introduce the ink from the front with the tip in position and to insert the writing ball on completion of the introduction of the ink. No centrifuging, which might lead to considerable de-mixing of the ink, is then necessary.

The width of the gap between the writing ball and the surrounding edge of the writing point is usually 1×10^{-4} to 5×10^{-4} , preferably 1×10^{-3} to 2.5×10^{-3} cm.

The polar and non-polar solvents customary in the ball point pen industry may be used as dispersing media for the metals.

The following examples are given to illustrate the inks used in the ball point pens and refills therefor according to the present invention:—

EXAMPLE 1.

To a mixture of 26 parts sulphonated castor oil (Turkey Red Oil), 16 parts polyglycol (molecular weight 400) and 8 parts glycerol, there are added 50 parts silver powder in flake form, the average particle size of which is 5—15 microns.

EXAMPLE 2.

To a solution of 20 parts chlorinated coumarone resin in 35 parts phthalic acid diethyl ester and 15 parts castor oil, there are added 30 parts aluminium powder in flake form, the average particle size of which is 1—10 microns.

EXAMPLE 3.

To a solution of 14 parts coumarone resin in 32 parts phthalic acid diethyl ester, there are added 6 parts aluminium powder in flake form, the average particle size of which is 1—10 microns, and 48 parts bronze powder consisting of an alloy of 92% copper and 8% zinc, the average particle size of which is 5—20 microns.

WHAT WE CLAIM IS:—

1. Ball point pens and refills therefor, containing an ink in paste form which comprises a polar or non-polar dispersing medium having dispersed therein finely-divided aluminium, silver or copper or an alloy or mixture thereof, in an amount of from 5 to 95% of the total weight of the ink.

2. Ball point pens and refills therefor according to Claim 1, wherein the finely-divided metal or alloy is present in the ink in an amount of from 20 to 80% of the total weight of the ink.

3. Ball point pens and refills therefor according to Claim 1 or 2, wherein the finely-divided metal or alloy is present in the ink in the form of flakes, the size of which is in the range of between 1 and 20 microns.

4. Ball point pens and refills therefor according to Claim 3, wherein the size of the flakes is within the range of between 5 and 15 microns.

5. Ball point pens and refills therefor according to Claim 1, substantially as hereinbefore described.

6. A method of filling the reservoirs of the ball point pens and of filling the ball point pen refills according to any of Claims 1 to 5, which comprises introducing the ink through the point of the pen and then inserting the writing ball into the point.

7. A method according to Claim 6, wherein the writing ball is of such dimensions that, between it and the surrounding part of the writing point, there is an annular gap of a width of between 1×10^{-4} and 5×10^{-4} cms. for the passage of the ball point ink during writing.

8. A method according to Claim 7, wherein the annular gap has a width of between 1×10^{-3} and 2.5×10^{-3} cms.

9. A method of filling the reservoirs of ball point pens and of filling ball point pen refills, substantially as hereinbefore described.

10. Ball point pens and refills therefor, whenever filled with ink by the method according to any of Claims 6 to 9.

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